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OUR KNOWLEDGE OF CALIFORNIA THYSANOPTERA PREVIOUS TO 1900

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Previous to the beginning of the twentieth century very little was known of this order of insects. Not only was this true in California but in North American as a whole. The systematic framework of the order was largely built in Europe by Linné, Haliday, Amyot and Serville, etc. Our early knowledge of the biology and anatomy was obtained by Buffa, Bohls, Jordan, and Garman. The monograph of Uzel[1] in 1895 brought together practically all the known facts of the order up to that time. In North America, Pergande, Fitch, Osborn, Beach, and Quaintance were some of the first to study thrips. Following the appearance of Hinds' monograph in 1902[2] and the forcibly generated interest in thrips as agricultural pests, many workers turned their attention to the Thysanoptera. Chief among these have been Hood, Moulton, and Watson.

We owe to the pear thrips, and its sudden appearance as an economic pest about 1902, the initial stimulus to the study of this group of insects in California. Miss S. M. Daniel, Dudley Moulton, D. L. Crawford, P. R. Jones, S. W. Foster, J. R. Horton, and H. M. Russell have been the chief contributors to our knowledge of the thrips of this state. Before the publication of Daniel (1904)[3], only four species were known from California: namely, *Thrips tabaci* Lind., *Heliothrips hæmorrhoidalis* (Bouché), and the two species described by Pergande (1895), *Frankliniella occidentalis* (Perg.) and *Hercothrips fasciatus* (Perg.)

The earliest published reference known to the writer indicating the presence of thrips in California is in 1882. This reference is found in the Pacific Rural Press, Vol. 24, page 156, in an article entitled "New Leaf Insects," which is here quoted in part:

[1] Uzel, H., Königgratz, (Published privately), 1895.
[2] Hinds, W. E., Proc. U. S. Nat. Mus. 26:79-242, 1902.
[3] Daniel, S. M., Ent. News, 15:293-297, 1904.

"The leaves received from Vacaville were infested with a species of thrip. Mr. Cook visited the section week before last and procured specimens of the species in all stages of its existance, larva, pupa, and perfect insect, which are mounted for microscopic use. The larva has the appearance of a small louse, with elongated abdomen, color primrose yellow, with a transverse orange color bar at base and a similar bar at tip of abdomen; the antennæ are five jointed, and the length of larva one-thirtieth of an inch. This insect is active in the pupa state, therefore the transformation is incomplete. The adult, or perfect insect, color brownish-black, with a brown transverse bar on prothorax, and two yellowish bands across the wings, antennæ eight or nine jointed, length of insect one-twenty-eighth of an inch." This thrips was collected by Matthew Cooke from Vaca and Pleasant valleys (Solano County) on pear, peach, plum, almond, beans, and sunflowers. The above-mentioned article also stated that "This species, in all probability, belongs to the genus *Melanthrips,* which means black thrips. Leaves received from Mr. Grooves, of Chico, were infested—also with thrips."

The following year (1883) Matthew Cooke's "Injurious Insects" was published and on pages 122-123 the same infestation was again discussed as follows:

"Last year, 1882, the owners of a great number of orchards complained that the leaves of the pear, peach, and plum trees were attacked by some insect or disease which caused them to wither and fall off. On examination they were found to be infested by a species of *Thrips* not heretofore noticed on fruit trees in this state.

"The leaves infested by these insects appeared marked all over their surface with minute black dots, either caused by the bite of these minute insects or were their excrements. Many of the branches, especially on the lower part of the tree, were denuded of their foliage."

The larva was described as one twenty-sixth of an inch in length and of a primrose-yellow color, with narrow, transverse orange markings. The adult was described as being one twenty-second of an inch in length, with a black body and black wings which have a silvery fringe and a transverse yellowish bar across the base.

The Second Biennial Report of the State Board of Horticulture of California, for 1885-86, contains three references to thrips. The first (page 354) by Klee is given in full below:

"Pleasant Valley (Solano County). The red mite, or spider, is abundant, and associated with it is often found a thrip, and without the statement of Mr. Thurber, an experienced horticulturist, to the contrary, I should certainly consider this latter very objectionable. According to this gentleman, this thrips has been known in this country for many years, without visibly affecting the fruits." And on page 399 (anonymous) is found the second reference:

"In several localities where hot, dry weather prevails, this insignificant looking little insect affects the foliage quite seriously, although in Pleasant and Vaca valleys, where it is mostly found, its presence is not greatly noticed. The remedies against this insect are sulphur washes, similar to those used against the red spider. The insect is generally spread with hothouse plants, and people receiving these should scrutinize them closely before setting them out in the garden. The general effect of the thrips is to wither the leaves, those affected showing its presence by their pale, blotched appearance."

From personal observations of the thrips' problem for a number of years in the districts referred to above, there can be no doubt that the species of thrips that Cooke observed was the bean thrips, *Hercothrips fasciatus* (Pergande), not described until 1895. In this non-irrigated locality, damage to pears (and other crops) from the bean thrips usually appears in mid-summer at the time red spider injury becomes evident. Another reason for this belief is that its general appearance is similar to that of the greenhouse infesting species which was becoming known to most entomologists and horticulturists at that time. However, the larva of *Heliothrips hæmorrhoidalis* (Bouché) are without colored markings and as far as is known, the greenhouse thrips has never been taken in this locality. The other species that often prove injurious in this section of Solano County, *Tæniothrips inconsequens* (Uzel), *Frankliniella occidentalis* (Perg.), and *F. moultoni* Hood, appear in the early spring, affect the buds and flowers, rarely blotch the leaves, and would not be associated with red spiders.

The third reference is that of Pohndorff: who wrote(page 533) in a memoir on olive growing that "*Thrips physaphus* (Linné), an insect of dirty white wings, is a pest probably analogous to the thrip that troubles our grapevine." As far as is known to the writer, *Thrips physaphus* has never been recorded from California and because of many early ambiguous references to "thrip" when meaning leaf-hoppers, it is impossible to know to what insect Pohndorff referred.

Riley and Howard (1891) published in Insect Life, vol. 4, nos. 1 and 2, page 79, in Extracts from Correspondence, a letter of June 8, 1891, from D. W. Coquillet of Los Angeles. The letter, with the reply is quoted below:

"I mail you today specimens of a thrips that is very injurious to the leaves of potato plants in various portions of Los Angeles County. I find them only on the underside of the leaves, and when numerous they cause the part of the leaf which they attack to wither and finally die. I saw one field of about 100 acres of potatoes of which a large percentage of the plants had been seriously injured by these pests; I also found them in large numbers on onions, and this species may prove to be the same as the one I sent you specimens of from onions last year. Besides potatoes and onions I also found them in large numbers on a plant commonly known as "Tumble-weed"; on this they were even more numerous than on the potatoes. I would be glad to receive the name of this thrips and to learn whether or not it is an introduced species. I am now carrying on a series of experiments against it with paris green and whale-oil soap and will report results.

"Reply—This is the same species which you sent last year upon onion, and is a new species of the true genus Thrips. (June 17, 1891.)"

Four years later Theodor Pergande described this species as *Euthrips occidentalis*,* in Insect Life, vol. 7, page 392, and Hinds (1902) redescribed it in full.

An undescribed species of thrips found on orange trees in Los Angeles was reported by C. V. Riley in 1892, Insect Life, vol. 5, No. 1, page 18. Unless specimens from this collection are still deposited in the National Museum or elsewhere, and

* Type now in National Museum, Washington, D. C.

can be examined, there is no way of knowing what species was concerned in this case.

Many early references in economic entomology record *Frankliniella tritici* (Fitch) from the Pacific Coast but present authorities are inclined to refer all such reports to *F. occidentalis* (Perg.) While the paper of Daniel first records H. *hæmorrhoidalis* from California in 1904, the writer believes that this species had been in the state for about ten years previous. About fifty years ago, the greenhouse thrips, one of the first species recognized as of economic importance in North America, was referred to as the "black fly" or "black thrip." Among its many greenhouse, ornamental, and exotic host plants is listed laurustine, an imported shrub (*Virburnum tinus*). The writer has observed this thrips injuring various plants outdoors in California from San Diego to Napa counties. With the above facts in mind, the citing of a portion of a report on Entomology and Quarantine by Alexander Craw in 1894 entitled "Black Thrip" leaves but little doubt that the species referred to was *Heliothrips hæmorrhoidalis.* The quotation from the Fourth Biennial Report of the State Board of Horticulture of California for 1893-94, page 87, is given below:

"A minute, narrow, black, six-legged insect, with four narrow, transparent wings bordered with light silvery hairs.

"This is an old and well-known pest of hot house plants. Occasionally it is found on laurestines, fuchsias, and other outdoor ornamental trees or shrubs in this state, but I can find no record of it as a pest on citrus trees. The past winter, however, I received specimens of oranges and orange leaves from San Diego County that were completely covered with light-colored young and fully developed black insects, together with the small, dark blotches that indicate the presence of this pest. The fruit had changed to a dull gray color that would ruin its commercial value. The leaves were also affected in a similar manner. This discoloration was caused by the bite of the thrips, for although they are classed with the order Hemiptera, they are provided with bristle-like mandibles, with which they tear the epidermis of the leaf or fruit. A careful examination of orange blossoms and other sweet-smelling flowers will reveal the presence of delicate but very active, yellowish insects. These are *Thrips tritici,* and will

give an idea of the appearance of the other, except in color. But the black thrips are slightly larger and more sluggish in their movements."

Thrips and leafhoppers, years ago, were referred to indescriminately as "thrip" and much confusion often resulted in attempting to distinguish between these two groups of pests. Professor C. W. Woodworth was one of the first to call attention to this ambiguous terminology at the 16th State Fruit Growers' Convention, San José, Nov. 15-18, 1892. His statement, published in the Fourth Biennial Report of the State Board of Horticulture of California for 1893-94, page 140, is as follows:

"Finally, I wish to speak of a little insect known as the thrip. There are two classes of insects which commonly receive this name. The false thrips of the grape and other plants is a leafhopper of the family *Jassidæ* . . . .The true thrips is a smaller insect and belongs to the *Thripidæ*. I learn that they have long been observed in the State doing a good deal of injury . . . The past season they were very bad on pear, prune, and almond in some parts of the State."

Attention should be called to the fact that in 1892, according to Professor Woodworth's statement, thrips were known to damage pear, prune and almond in *some* sections. It is unfortunate that these localities were not designated. If they had been, we might be able to either refer this report to the bean thrips or more accurately fix the first appearance of the pear thrips in California, which was undoubtedly previous to 1902.

Heretofore, the first published record of the bean thrips was considered to be that in Insect Life, vol. 7, page 391, 1895, when it was reported as collected in Yuba County, in November, 1894, by G. W. Harney. Pergande described it as *Heliothrips fasciata** at that time and it was later (1902) fully redescribed by Hinds.

In the same paper Pergande wrote concerning the onion thrips "The notes of the Department of Agriculture regarding this species (*Thrips tabaci* Lind.) show that it was received during 1889 and 1891 from Mr. Coquillett, from Los Angeles, Cal., where it was very injurious to the onions in that section of the State." This appears to be the first published record of the onion thrips in California but it doubtless was brought in many years

* Type now in National Museum, Washington, D. C.

previous on onion bulbs since this cosmopolitan thrips is commonly found everywhere on onions, both in the field and in storage.

We may then sum up this account of the early history of thrips in California by saying that their potential importance as crop pests was first observed in 1882 and that previous to 1900 only four species were recorded from this greatly diversified agricultural area. Of these four species, two (*T. tabaci* and *H. hæmorrhoidalis*) were doubtless introduced, and two (*F. occidentalis* and *H. fasciatus*) were native.

Early References to California Thrips

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A Cactus Destroyer

A small moth identified as *Dyotopasta yumælla* Kearf., (*Tineidæ*), by H. H. Keifer, was found to be killing many clumps of a small more or less spineless species of cactus, probably *Opuntia basilaris* Engelm., in the Walker Pass Region of Kern County, California. During the early part of April, 1936, I found the main trunks of many plants thoroughly honeycombed by the larvæ which were numerous and which had reduced the tissues to a liquid and putrid condition, with the result that the plants were rapidly wilting.—Edwin C. Van Dyke.

Weevil Larvæ Annoying to Householders

A. E. Michelbacher reports that during the early part of April, 1936, numerous larvæ and recently developed adults of a poplar weevil, tentatively identified as *Dorytomus nubiculinus*